

Class: FIRST YEAR
Time:

Course #: ENTER94

20DAAEBBDEC	DEEACDCCBD	EABBABAABA	AACCBAAEAA	ABAAABABAA
20: 1234567890	1234567890	1234567890	1234567890	1234567890
Answers: *****	***E*****	*****B*B	**E*****	***B*****
Test Key: BDCAABDBAA	ABBABADCCA	BEBBCDEECC	CABDEEEECAB	DEBACADDBC
Items 51-100: 1234567890	1234567890	1234567890	1234567890	1234567890
Student's Answers: DEE***E***	*****	****D*****	**AEC*D***	E*****E***

BONUSED QUESTIONS = 36, 97

MICROANATOMY MIDTERM EXAMINATION
JANUARY 20, 1995

SELECT THE SINGLE BEST ANSWER:

1. The defining limiting barrier of a cell is its:
 - A. glycocalyx.
 - B. plasma membrane.
 - C. cytoskeleton.
 - D. organelles.
 - E. nucleus.

2. Clathrin-coated vesicles are involved in...
 - A. pinocytosis.
 - B. receptor mediated endocytosis.
 - C. lysosomal transport vesicle recycling.
 - D. All of the above.
 - E. None of the above.

3. A voltage-gated ion channel is best described as a
_____.
 - A. transmembrane protein
 - B. peripheral protein
 - C. lipoprotein
 - D. glycoprotein

4. Which is NOT a function of the Golgi Apparatus?
 - A. Peptide bond formation
 - B. Carbohydrate hydrolysis
 - C. Terminal glycosylation
 - D. Phosphorylation and sulfation
 - E. Protein sorting

5. Tubulin is associated in some important way with each of the following EXCEPT:
 - A. cilia.
 - B. mitotic spindle.
 - C. centrioles.
 - D. microtubules.
 - E. rough endoplasmic reticulum.

6. Which of the following is NOT true about the cell nucleus?
- A. It is surrounded by a double membrane called the nuclear envelope.
 - B. All cells in the human body have one or more.
 - C. There are large pores in the nuclear envelope.
 - D. The DNA is differentially packed relating to different rates of protein synthesis.
 - E. Ribosomal RNA is synthesized in the nucleolus.
7. DNA duplication occurs during....
- A. G-1 phase.
 - B. S phase.
 - C. G-2 phase.
 - D. M phase.
 - E. G-0 phase.
8. Metaphase is characterized by
- A. disappearance of the nuclear membrane.
 - B. condensation of the chromosomes.
 - C. chromosome attachment to the kinetochore.
 - D. chromosome alignment at the equatorial plate.
 - E. formation of the cleavage furrow.
9. The proteins that are involved in the thickening of the nuclear envelope and help to maintain the integrity of the nucleus are:
- A. centrioles.
 - B. kineticores.
 - C. histones.
 - D. dyneins.
 - E. lamins.
10. Key proteins involved in nucleosome packing are:
- A. tubulins.
 - B. lamins.
 - C. histones.
 - D. centrioles.
 - E. kinetochores.

11. Spindle fibers are attached to chromosomes by:
- A. dyneins.
 - B. keratins.
 - C. lamins.
 - D. kinetochores.
 - E. centrioles.
12. Which is NOT a component of the normal dividing cell cycle?
- A. G-1 Phase
 - B. S Phase
 - C. G-2 Phase
 - D. M Phase
 - E. G-0 Phase
13. Telophase is characterized by:
- A. the disappearance of the nuclear membrane.
 - B. condensation of chromosomes.
 - C. kinetochore attachment to chromosomes.
 - D. chromosome alignment at an equatorial plate.
 - E. reformation of the nuclear envelope and nucleolus.
14. When a gland is described as a compound gland, it means that the gland:
- A. has branched ducts.
 - B. consists of secretory cells that liberate their secretory product via merocrine secretion.
 - C. contains clusters of secretory cells that vary in shape.
 - D. is present in the connective tissue layer beneath the epithelium.
 - E. consists of two different types of secretory cells.
15. Stratified epithelia are named according to:
- A. the shape of the most basal cells.
 - B. the type of cell to cell association.
 - C. the shape of the most superficial cells.
 - D. A and C above are correct.
 - E. A, B and C above are correct.

16. The epithelial layer in the secretory region of sweat glands is....
- A. simple squamous.
 - B. stratified squamous non-keratinizing.
 - C. stratified squamous keratinizing.
 - D. simple cuboidal.
 - E. transitional.
17. The epithelium of the vagina and the esophagus is classified as:
- A. simple squamous.
 - B. stratified squamous keratinizing.
 - C. stratified squamous non-keratinizing.
 - D. simple cuboidal.
 - E. transitional.
18. Muscle spindles are....
- A. specialized sensory organs in tendons that function as strain gauges.
 - B. smooth muscle cells of fusiform shape.
 - C. specialized encapsulated sensory receptors located within striated muscles.
 - D. groups of small, smooth muscle fibers with special motor and sensory innervation.
 - E. especially innervated spindle-shaped dilations of striated involuntary muscle fibers.
19. The source of energy for the initial contraction of skeletal muscle is derived from...
- A. the glycolytic activity of myosin.
 - B. the adenosine triphosphatase activity of myosin.
 - C. release of energy due to cyclical conformational changes in actin.
 - D. adenosine triphosphatase activity of tropomyosin.
 - E. A and B only.
20. A cytological feature common to cardiac muscle cells, myofibroblasts, and cleavage furrow formation is:
- A. sacroplasmic reticulum.
 - B. thick filaments.
 - C. triads.
 - D. actin filaments.
 - E. basement membrane.

21. In a cardiac muscle cell, the sarcoplasmic reticulum...
- A. occurs in the form of triads.
 - B. conducts the action potential to the interior of the cell.
 - C. is most obvious during cell division.
 - D. is directly continuous with the sarcolemma.
 - E. is able to release and take up calcium.
22. In skeletal muscle, the release of calcium from the sarcoplasmic reticulum is triggered by:
- A. inositol 1,4,5-triphosphate.
 - B. calcium influx during the muscle action potential.
 - C. acetylcholine.
 - D. ATP.
 - E. creatine.

TRUE OR FALSE: A = TRUE; B = FALSE

23. Glycogen and lipid droplets are membrane-encircled cell inclusions.
24. The phosphorylated carbohydrate responsible for directing proteins to the lysosomal compartment is glucose 6-phosphate.
25. The functions of the smooth endoplasmic reticulum include, but are not limited to, steroid hydroxylation and drug detoxification.
26. In a pure white muscle, such as the tail of a lobster, ATP production will occur principally via mitochondrial oxidative phosphorylation.
27. The mode of secretion of a sebaceous gland is holocrine.
28. Endocrine glands are embryologically derived from epithelium.
29. Smooth muscle cells have round nuclei located at the periphery of the cell.
30. Gap junctions are present in smooth muscle and cardiac muscle.
31. The close association of the zonula occludens, the zonula adherens, and desmosomes near the apical surface of epithelial cells is called the junctional complex.
32. The binding of calcium to calmodulin, and the activation of light chain kinase are normal events in the contractile cycle of smooth muscle.

SELECT THE SINGLE BEST ANSWER:

33. Select the correct statement.

- A. Fat cells are not found in areolar connective tissue or red bone marrow.
- B. Reticular tissue can not be found in aged persons (70 years old or older).
- C. Muroid tissue is an connective tissue containing abundant amounts of hyaluronic acid.
- D. Mesenchymal fibers are found only in the adolescent.
- E. None of the above are correct.

34. Select the correct statement.

- A. Mast cells are found only in the dense irregular connective tissue of the skin.
- B. Eosinophils would never be found in areolar connective tissue of the glands in the skin.
- C. Fibronectin and laminin are glycoprotein molecules in the extracellular space which cells use to move about.
- D. Mast cells are the one wandering connective tissue cell which is not involved in a hypersensitivity reaction (eg. bee sting).
- E. None of the above are correct.

35. Select the cell which is NOT derived from a monocyte.

- A. Alveolar macrophages
- B. Pericytes
- C. Microglia
- D. Von Kuppfer cells
- E. Osteoclasts

36. Select the correct statement about fat tissue.

- A. The plasmalemma of white fat cells contain insulin receptors which, when activated, turn on or up regulate the hormone-sensitive lipase system to release fatty acids into the blood.
- B. There is no ground substance in fat tissue.
- C. Brown fat is found only in embryonic bone marrow.
- D. The principal function of fat is to create the "proper curves" in the human body form.
- E. None of the above statements is true.

37. Select the correct statement.

- A. Elastic fibers are made up of a fibrous protein which can stretch and then return to its original length.
- B. Collagen fibers are made up by the cross linking between the procollagen molecules.
- C. Reticular fibers contain type I collagen fibers surrounded by glycogen.
- D. The interstitial fluid consists exclusively of the excess water which has already drained into lymphatic capillaries.
- E. None of the above statements are correct.

38. Select the correct statement.

- A. All cells have basement membranes.
- B. The highest concentrations of hyaluronic acid in the human body is normally found in the ground substance of bone.
- C. Edema is the reduction of interstitial fluid.
- D. Edema can be caused by the overproduction of collagen in the extracellular connective tissue space.
- E. Hyaluronidase, found in most pathogenic bacteria, enable these bacteria to spread through the extracellular connective tissue space of the body.

TRUE OR FALSE: A = TRUE; B = FALSE

- 39. The four basic tissue types of the human body are; nerve, connective tissue, muscle, and epithelium.
- 40. A person with a connective tissue disease in which lots of collagen was breaking down at an abnormally high rate, would have an elevated hydroxyproline level in their urine.
- 41. In scurvy, the lack of vitamin C indirectly prevents the proper cross linking within the tropocollagen molecules. This weakened collagen or lack of collagen fibers weakens the connective tissue and permits the rupture a numerous small blood vessels which leads to some of the clinical symptoms of scurvy.
- 42. The parenchyma of a peripheral nerve consists of the epi-peri- and endoneurium.
- 43. Fibroblasts(-cytes) and chondrocytes can secrete tropoelastin.
- 44. Desmosine is an amino acid unique to elastin.
- 45. Oxytalan fibers are part of the elastic fiber system.

TRUE OR FALSE: TRUE = A; B = FALSE

- 46. Cartilage is always covered by a perichondrium.
- 47. Fibrocartilage is found in places where there is a need for firm support but with some give and flexibility, like in the intervertebral disc.
- 48. Cartilage can increase in size only by interstitial growth.
- 49. The articular cartilage contains collagen fibers to reinforce the cartilage tissue against shear forces generated by the movement of the bones.
- 50. The slipperiness of the articular cartilage is aided by the expression of the water of hydration within the proteoglycans aggregates.

SELECT THE SINGLE BEST ANSWER:

- 51. Select the correct statement.
 - A. Osteoblasts primary function is to reabsorb bone matrix.
 - B. All long bones in an adult, over thirty something, consist of lamellar bone.
 - C. The ground substance of bone contains more sulfated-gylcosaminoglycans than cartilage matrix.
 - D. Hydroxyapetite crystals are found only in bone tissue.
 - E. All of the above are correct.
- 52. Bone osteoid is....
 - A. the deposition of calcium phosphate crystals.
 - B. osteons left after remodelling.
 - C. the cells that line the bone marrow cavity.
 - D. the organic portion of bone matrix when it is first laid down.
 - E. None of the above.
- 53. The principal structural unit of a trabeculum found in an adult male humerus is the
 - A. osteon.
 - B. interstitial bone.
 - C. trabecular packet.
 - D. interstitial lamellae.
 - E. woven bone.

54. If your blood calcium is low, additional parathyroid hormone secretion will...
- A. increase your blood calcium.
 - B. decrease the activity and numbers of osteoclasts.
 - C. increase the amount of calcification occurring in bones.
 - D. will not affect your blood calcium at all.
 - E. decrease your blood calcium.
55. Periosteum will
- A. usually increase the diaphyseal circumference of a growing bone.
 - B. form interstitial lamellae.
 - C. be the innermost lining of the osteons.
 - D. form the cement line of an osteon.
 - E. form Howship's lacunae.
56. Select the correct statement. Sharpey's fibers are ...
- A. responsible for the exchange of nutrients and wastes between the osteocytes and blood vessels.
 - B. bundles of collagen fibers which help to attach tendons and periosteum to the bone tissue.
 - C. supply blood to the vessels in the Haversian system.
 - D. found only in the metaphysis of the bone.
 - E. found only in woven bone.
57. The knee joint is an example of
- A. diarthrodial joint.
 - B. synovial joint.
 - C. cartilagenous joint.
 - D. A & B are correct.
 - E. A, B & C are correct.

TRUE OR FALSE: TRUE = A; B = FALSE

58. Internal remodelling of bones slows down and stops by the age of 55 in most males.
59. Repair of bone fractures is based on bone formation by the endosteum and periosteum followed by internal remodeling.
60. A person has the potential to continue to grow in height until his/her's epiphyseal plates in long bones close.
61. A lack of vitamin D reduces the amount of calcification in the growing bones of children and can result in "bowed legs".

TRUE OR FALSE: TRUE = A; B = FALSE

- 62. Primary and secondary ossification centers are found only in the large, long bones of the body.
- 63. Intramembranous ossification is found only in the flat bones of the skull.
- 64. Endochondral ossification only occurs where there is a pre-existing hyaline cartilage model of the bone.
- 65. Osteoblasts are the principal cell type of the zone of proliferation in the epiphyseal plate.
- 66. All bone growth is by appositional growth.

SELECT THE SINGLE BEST ANSWER:

- 67. All of the following statements concerning the term "hematocrit" are correct EXCEPT:
 - A. It is defined as the percentage of the blood volume that is made up of erythrocytes per unit volume of blood.
 - B. The normal value is 40-50% in adult males.
 - C. The normal value is 35-45% in adult females.
 - D. It becomes significantly elevated when a person has an acute infection.
 - E. It is determined by centrifuging a blood sample to separate the plasma from the cellular elements.
- 68. Which of the following is NOT normally present in plasma?
 - A. Albumin
 - B. Immunoglobulins (antibodies)
 - C. Fibrin
 - D. Amino acids
 - E. Hormones

MATCHING: A choice may be used once, more than once or not at all.

Match the cell type with the most appropriate function/description.

- A. Neutrophil
- B. Eosinophil
- C. Basophil
- D. B Lymphocyte
- E. Monocyte

69. _____ This cell has specific cytoplasmic granules containing heparin and histamine.
70. _____ This cell is the first to migrate from the blood circulation to the site of an acute bacterial infection.
71. _____ These cells are able to suppress or down regulate allergic reactions.
72. _____ This cell is best at processing and presenting antigens to cells of the immune system.

SELECT THE SINGLE BEST ANSWER:

73. Which of the following cells are **NOT** normally found in peripheral blood.
- A. Helper T lymphocytes
 - B. Megakaryocytes
 - C. B lymphocytes
 - D. Suppressor T lymphocytes
 - E. Null lymphocytes
74. During granulopoiesis, specific granules first become visible in the cytoplasm during the:
- A. promyelocyte stage
 - B. myelocyte stage
 - C. metamyelocyte stage
 - D. band stage
 - E. concert stage
75. The cell which is the progenitor of all eosinophils is the:
- A. eosinophilic band cell.
 - B. eosinophilic myelocyte.
 - C. eosinophil-colony-forming cell.
 - D. myeloid multipotential stem cell.
 - E. lymphoid stem cell.

76. Which of the following statements concerning reticulocytes is NOT true.
- A. They are distinguishable from mature erythrocytes based upon their morphology when stained with brilliant cresyl blue.
 - B. They normally make up 1% of the circulating erythrocytes.
 - C. Abnormally high numbers of reticulocytes in the blood represent a shift to the left.
 - D. Reticulocyte numbers increase in the blood when the life span of the circulating mature erythrocytes is increased to 240 days.
 - E. Reticulocytes are formed when orthochromatophilic erythroblasts expel their pyknotic nuclei.
77. Which of the following can stimulate an increase in the number of neutrophils present in the circulating blood?
- A. Erythropoietin
 - B. Granulocyte colony stimulating factor (G-CSF)
 - C. Reduced oxygen concentration in the lungs
 - D. An acute bacterial infection
 - E. Both B and D are correct.
78. The characteristic cytoplasmic staining pattern of the polychromatophilic erythroblast is due to the presence of:
- A. abundant DNA in the cytoplasm.
 - B. abundant ribosomes in the cytoplasm.
 - C. abundant hemoglobin in the cytoplasm.
 - D. abundant eosinophilic specific granules in the cytoplasm.
 - E. significant amounts of both ribosomes and hemoglobin in the cytoplasm.
79. Which of the following statements concerning platelets is NOT true?
- A. They are produced by megakaryocytes in the red bone marrow.
 - B. They are second only to erythrocytes as the most abundant ($\#/mm^3$) of the formed elements in the blood.
 - C. They release heparin and histamine when they are activated at the site of damage to a blood vessel
 - D. They have an average diameter of 2-4 microns.
 - E. They contain several types of granules, a marginal microtubule bundle, and an open canalicular system

80. Which of the following statements concerning lymphatic nodules is NOT true?
- A. They represent sites of lymphocyte clonal proliferation in response to the presence of an antigen.
 - B. They are located in the cortex of lymph nodes.
 - C. Secondary nodules contain pale staining cores of large immature T-lymphocytes.
 - D. Lymphatic nodules are dynamic structures which develop and then gradually dissociate in response to exposure to antigens.
 - E. Germinal centers are present in secondary lymphatic nodules.
81. Which of the following statements concerning high endothelium venules (HEVs) is NOT true?
- A. They represent sites of entry for lymphocytes circulating in the blood to enter lymph nodes and lymphatic tissues.
 - B. They play a role in the transfer of immunological information from one lymph node or lymphatic tissue to another.
 - C. They contain an unusually thick layer of smooth muscle in their wall compared to typical venules .
 - D. They are found in the cortico-medullary junction region of lymph nodes.
 - E. Lymphocytes can selectively bind to the endothelial cells of HEVs via homing receptors like CD 44.
82. Which of the following structures is a pathway for blood cells during "OPEN" type blood circulation BUT NOT a blood cell pathway during "CLOSED" type blood circulation in the spleen?
- A. Gaps between adjacent endothelial cells of the red pulp sinuses
 - B. Penicillar arterioles
 - C. Marginal sinuses
 - D. Central arteries
 - E. Red pulp veins
83. Filtration and detection of blood borne foreign antigens occurs primarily at which of the following sites in the spleen?
- A. Central arteries
 - B. Marginal sinuses
 - C. Penicillar arterioles
 - D. Red pulp veins
 - E. Trabecular veins
- open → B, C
closed → D, E*

84. Which of the following is NOT a component of the blood-thymus barrier?

- A. Epithelial reticular cells
- B. Capillary endothelium
- C. Basal lamina of the capillary endothelium
- ☒ D. Capsule of the thymus
- E. Basal lamina of the epithelial reticular cells

85. Select the correct statement. Penetration of the blood-thymus barrier by an antigen at or just before birth leads to:

- A. the death of the developing T-lymphocytes in the thymic cortex which have surface receptors that will bind to the penetrating antigen.
- B. the stimulation of the T-lymphocytes and the production of many mature T-lymphocytes with surface receptors specific for the penetrating antigen.
- C. the induction of immunological tolerance to a later exposure to the penetrating antigen.
- D. None of the above choices are correct .
- E. Both A and C are correct.

86. Which of the following statements concerning lymph is NOT true?

- A. It is composed basically of extracellular fluid and often contains lymphocytes.
- B. It is produced when the extracellular fluid seeps into lymphatic capillaries.
- C. It eventually drains into the cardiovascular system.
- D. It can carry antigens from an infection to a nearby lymph nodes to stimulate an immune response.
- E. It exits a lymph node via high endothelial venules in the medullary region.

MATCHING: You may use a term once, more than once, or not at all.

Match the cell with the proper normal tissue type.

- A. Reticular cell
- B. Mesenchymal cell
- C. Reticulocyte
- D. Fibroblast (-cyte)
- E. None

- 87. _____ Fibrocartilage
- 88. _____ Peripheral blood smear
- 89. _____ Pharyngeal tonsil
- 90. _____ Mesenchyme
- 91. _____ Periosteum

SELECT THE SINGLE BEST ANSWER:

- 92. All of the following elements participate in the Blood-Brain barrier **EXCEPT**....
 - A. "tight junctions" of the brain capillary endothelial cells.
 - B. pericytes surrounding the capillary endothelial cells.
 - C. the basement membrane of the capillary endothelial cells.
 - D. the foot-like processes of astroglial cells which abut the basement membrane.
 - E. the ependymal connective tissue surrounding the capillaries.
- 93. Which of the following statements is **NOT** true? Neuronal neurofilaments...
 - A. are the most numerous of the neuronal cytoplasmic filaments.
 - B. are composed of two strands of globular actin wound into a double stranded helix.
 - C. are generally aligned in parallel bundles.
 - D. are formed from a cytokeratin-like tetramer.
 - E. are found in abnormal aggregations called "neurofibrillary tangles" in Alzheimer's disease.

94. The granular endoplasmic reticulum and ribosomes of the neuron cell-body are often prominently stained and referred to as...
- A. Nissl bodies (substance).
 - B. neurofibrils.
 - C. mitochondria.
 - D. axoplasm.
 - E. None of the above.
95. Which of the following is the correct sequence over which a nerve impulse would normally travel on its way to a synapse?
- A. Receptor - axon - dendrite
 - B. Dendrite - receptor - axon
 - C. Dendrite - cell body - axon
 - D. Axon - cell body - dendrite
 - E. None of the above
96. Select the correct statement about neuroglia.
- A. Neuroglia are more numerous than neurons.
 - B. Neuroglia do not proliferate in the adult nervous system.
 - C. Neuroglia are large cells when compared to neurons.
 - D. Astroglia are the myelin-forming cells of the CNS.
 - E. Microglia are derived from neurons and therefore possess axonal processes.
97. Un-myelinated axons of the PNS are...
- A. naked neuronal processes devoid of any structural association with the Schwann cells.
 - B. axons of large diameters.
 - C. conduction fibers for tactile discrimination.
 - D. conduction fibers for somatic sensation of pain and temperature.
 - E. None of the above.
98. Which of the following statements is NOT true for the synaptic vesicles of the chemical synapse?
- A. Synaptic vesicles are membrane bound vesicles.
 - B. Synaptic vesicles are released by the pre-synaptic terminals at the active zones of the presynaptic density.
 - C. Synaptic vesicles are often associated with the presence of mitochondria and synaptic bars (membrane densities).
 - D. Synaptic vesicles are transported from cell body to the synaptic terminals by the mechanism of neuronal impulses (action potential)

99. The action potential component of the nerve impulse is generated in...
- A. dendritic spines.
 - B. the axon hillock and initial segment.
 - C. the axonal bouton.
 - D. Nissl bodies.
 - E. synaptic vesicles.
100. In the peripheral nervous system, the myelin sheath of neurons is formed by...
- A. the cellular secretions of neurons.
 - B. fusion of the plasma membranes of astrocytes.
 - C. Schwann cells.
 - D. oligodendrocytes.
 - E. microglia.

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